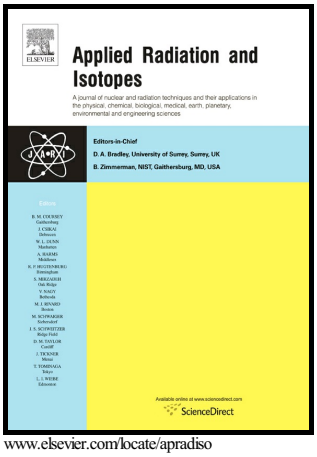

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Preparation and Cathodoluminescence characteristics of rare earth activated $BaAl_2O_4$ phosphors

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Abstract

Undoped and Pr, Sm and Tb activated $BaAl_2O_4$ phosphors have been synthesized by solid state reaction method and combustion method. The structure and *morphological* observation of the phosphor samples were monitored by X-ray powder diffraction (XRD) and environmental scanning electron microscope (ESEM) coupled to an energy dispersive X-ray spectrometer (EDS). The all diffraction peaks are well assigned to standard data card (PDF#17-306). Emission properties of the samples were explored using light emission induced by an electron beam (i.e cathodoluminescence, CL) at room temperature (RT). Undoped $BaAl_2O_4$ sample exhibits a broad defect emission from 300 to 500nm from the aluminate defect centres. CL spectra recorded at room temperature display that the as-prepared $BaAl_2O_4$:Ln (Ln=Pr, Sm and Tb) phosphors exhibit different luminescence colors coming from different rare earth activator ions. The transition $^4G_{5/2} \rightarrow {}^6H_{7/2}$ located at 606 and 610 nm for Sm^{3+} can occur as hypersensitive transition having the selection rule $\Delta J = \pm 1$. For the Tb^{3+} doped samples, they exhibit $^5D_4 \rightarrow {}^7F_j$ $(J = 6, 5, 4, 3, 2)$ green line emissions. The proposed luminescent mechanisms of all doped rare earth ions are also discussed.

Keywords: $BaAl_2O_4$, rare earths, XRD, Cathodoluminescence

1. Introduction

As a well-known host material, rare earth doped aluminate-based phosphors that emit light in the visible range have been actively studied in the last decade due to their good chemical stability, brightness, high quantum efficiency and applications in lighting and display devices (Suchinder et al, 2009; Tang et al., 2000; Chang et al., 2007; Kumar et al.